

II.1 Introduction

(See Section 1 of the current Nomination Form and Section 1, 2 and 3 of the original Nomination Forms)

1a) State Party:
USA

1b) Name of World Heritage property:
Grand Canyon National Park

1c) Please provide geographical coordinates for the site to the nearest second. (In the case of large sites, please give three sets of geographical coordinates.)

Geographical coordinate: Long. 111 min. 36 sec./Lat. 36 min. 52 sec.

Geographical coordinate: Long. 111 min. 36 sec./Lat. 35 min. 44 sec.

Geographical coordinate: Long. 113 min. 56 sec./Lat. 35 min. 44 sec.

Geographical coordinate: Long. 113 min. 56 sec./Lat. 36 min. 52 sec.

1d) Give date of inscription on the World Heritage List.

date (dd/mm/yyyy): 26/10/1979

1e) Give date of subsequent extension(s), if any.

1f) List organization(s) responsible for the preparation of this site report.

Organization #1

Organization Name: U.S. National Park Service, Grand Canyon National Park

Last Name: Alston

First Name: Joseph

Title: Superintendent

Address: P.O. Box 129

City: Grand Canyon

State/Prov: Arizona

Postal Code: 86023-0129

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II.2 Statement of Significance (see Section 2 of the current Nomination Form and Section 5 of the original Form)

2a) When a State Party nominates a property for inscription on the World Heritage List, it describes the heritage values of the property which it believes justifies the inscription of the property on the World Heritage List. Please summarize the justification for inscription as it appears in the original nomination of the property.

Grand Canyon National Park contains an outstandingly broad, and dramatically exposed, record of geological history and biological evolution. All four major eras of Earth's history are represented, from the Precambrian to the Cenozoic. Most notable is an unparalleled sequence of undisturbed Paleozoic strata spanning five geologic periods. Paleontological remains document the evolution of life forms from single-celled organisms in the Precambrian Era; through the development of plants, invertebrates, fish, and reptiles in the Paleozoic Era; to the extinct giant birds and mammals of the Pleistocene. The paleontological record includes species still living in Grand Canyon today.

The Grand Canyon of the Colorado River is one of the world's finest examples of uplift and erosion. These geological processes are dynamically illustrated as the forces of water, wind, and mass wastage continue to enlarge the canyon and sculpt its myriad temple-like landforms. The Grand Canyon is significant for its size alone. It is 277 miles (446 km) long, 18 miles (29 km) across at its widest, and 1 mile (1.6 km) deep at its deepest.

The immense scale and ruggedness of this landform, as well as its ranks of cliffs, buttes, and spires, its colorful rock layers, plunging abysses, and vistas that extend for 60 miles (100 km) or more all contribute to a landscape of superlative beauty and power. Within the canyon, towering walls dwarf the Colorado River, the largest watercourse in the southwestern United States. On a more intimate scale, side canyons feature cascading streams, spectacular waterfalls, and pools of blue-green water. In these settings, ferns, rushes, and flowering plants create oases in a prevailing desert landscape. High on the North Rim, dark green conifer forests, alpine meadows, and groves of golden aspen provide stunning beauty of an altogether different kind.

The extraordinary ecological diversity of the site is largely a function of its topography and extremes in elevation, temperature, and precipitation. Elevation ranges from 8,000 feet (2,400 m) above sea level on the North Rim down to 1,200 feet (360 m) at the lowest river level. From the North Rim to the bottom of the canyon, mean high temperatures range from 77 degrees F (25 degrees C) to 105 degrees F (40 degrees C) and mean low temperatures range from 15 degrees F (-9 degrees C) to 38 degrees F (3 degrees C). Mean annual precipitation ranges from 40 inches (100 cm) to 8 inches (20 cm). Five of North America's seven life zones (per the C. Hart Merriam classification) are represented within park boundaries. Major vegetation communities include spruce/fir and aspen/ponderosa forests, pinyon/juniper/oak woodland, grassland, scrubland, and desert. Elements of three of North America's four desert ecosystems (Great Basin, Sonoran, and Mohave) are present in the inner canyon. Wetland, riparian, and aquatic communities are scattered throughout the park at seeps, springs, streams, and the Colorado River. Numbers of known species occupying these habitats include 89 mammals, 373 birds, 56 reptiles and amphibians, 17 fishes, 70 crustaceans and mollusks, 8,480 other

invertebrates, and 1,987 plants. Of these species, at least 12 are endemic to the park. The barriers created by Grand Canyon's extreme and abrupt differences in topography and environmental conditions have produced textbook examples of speciation.

Rare organisms within Grand Canyon National Park include eight animal and one plant species listed as threatened or endangered by the United States Government. A tenth species is currently a candidate for listing. Over 40 additional species are designated as Species of Special Concern, thereby warranting special consideration in all park-related management decisions. As a national park, Grand Canyon provides the maximum protection afforded by the United States Government for rare species and for the ecological systems on which they depend. For the most part, the park's vast amount of unmodified habitat provides excellent conditions for the continued survival of these species. Additional protection is provided by the large expanses of undeveloped federal and tribal lands that surround the park.

The major exception to natural conditions within Grand Canyon National Park is the Colorado River ecosystem, which was significantly modified by the construction of Glen Canyon Dam, just upstream of the park, in 1963. Widely varying seasonal flows have been replaced by dam releases governed by reservoir levels, legal water delivery requirements, and hydroelectric power demands. Widely varying seasonal water temperatures have been replaced by year-round cold-water temperatures. Very heavy sediment loads have been replaced by clear water releases. Other ecosystems in the park have been altered to some degree by a century of fire suppression and former livestock grazing.

2b) At the time of initial inscription of a property on the World Heritage List, the World Heritage Committee indicates the property's outstanding universal value(s) (or World Heritage value(s)) by agreeing on the criteria for which the property deserves to be included on the World Heritage List. Please consult the report of the World Heritage Committee meeting when the property was listed and indicate the criteria for which the Committee inscribed the property on the World Heritage List. (Choose one or more boxes.)

Cultural Criteria

- i
- ii
- iii
- iv
- v
- vi

Natural Criteria

- i
- ii
- iii
- iv

2c) At the time of initial inscription, did the World Heritage Committee agree upon a Statement of Significance for the WHS? (Consult the report or minutes of the World Heritage Committee meeting when the property was listed.

NO

2c1) If YES, please cite it here.

2c2) If NO please propose a Statement of Significance for the World Heritage Site based on the consideration given the property by the Committee when it inscribed the property on the World Heritage List. (Note: Following the completion of the Periodic Report exercise, the State Party, in consultation with appropriate authorities, will determine whether to proceed with seeking a Committee decision to approve any proposed Statement of Significance. The Committee must approve any proposed Statement of Significance through a separate, formal process. See 7g.)

The Committee inscribed **Grand Canyon National Park** on the World Heritage List under natural criteria (i), (ii), (iii) and (iv). According to the IUCN, "[t]he characteristics of the Grand Canyon are so exceptional that they meet all four of the criteria..." for universally significant natural areas.

Criterion (i): Within park boundaries, the geologic record spans all four eras of the earth's evolutionary history, from the Precambrian to the Cenozoic. The Precambrian and Paleozoic portions of this record are particularly well exposed in canyon walls and include a rich fossil assemblage. Numerous caves shelter fossils and animal remains that extend the paleontological record into the Pleistocene.

Criterion (ii): Grand Canyon is a superlative example of arid-land erosion, an ongoing geological process, and one of nature's finest monuments to the combined forces of deposition, uplift, erosion, and gravity. It is probably the largest terrestrial canyon on earth in terms its overall dimensions.

Criterion (iii): Widely known for its exceptional natural beauty and considered one of the world's most visually powerful landscapes, the Grand Canyon is celebrated for its plunging depths; temple-like buttes; and vast, multi-hued, labyrinthine topography. Scenic wonders within park boundaries include high plateaus, plains, deserts, forests, cinder cones, lava flows, streams, waterfalls, and one of America's great whitewater rivers.

Criterion (iv): The park's diverse topography has resulted in equally diverse ecosystems. Five of North America's seven life zones are represented in a remarkably small geographic area. Grand Canyon National Park is an ecological refuge, with relatively undisturbed remnants of dwindling ecosystems (such as boreal forest and desert riparian communities), and numerous endemic, rare or endangered plant and animal species.

2d) *Since the original inscription of the property on the World Heritage List, has the World Heritage Committee agreed with a proposal by the State Party that the property be recognized for additional World Heritage values and added additional criteria to the inscription as a result of a re-nomination and/or extension of the property?*

NO

2d1) *If YES, please indicate which new criteria were added and the date. (dd/mm/yyyy)*

II.3 Statement of Authenticity / Integrity
(See Section 2 of the current Nomination Form and Section 4 of the original Form)

3a) *In addition to meeting one or more of the criteria, which justify inscription on the World Heritage List, a natural or cultural property must meet the appropriate conditions of authenticity and/or integrity, as defined in clauses 24b and 44b of the Operational Guidelines for Implementing the World Heritage Convention. If at the time of inscribing the property on the World Heritage list, the State Party and the International Council on Monuments and Sites, ICOMOS and/or the International Union for Conservation of Nature and Natural Resources, IUCN, evaluated the authenticity and integrity of the property, please cite those evaluations here. (Please quote directly from the nomination, Committee minutes and the Advisory Body's evaluation.)*

INTEGRITY: "The park has been managed by the US National Park Service as a National Park since 1919. A management plan has been prepared (August 1976).

Conservationists argue that the wilderness character of the park is being destroyed through excessive visitor use (National Geographic, July 1978). There is little doubt that excessive visitor use may have an impact on some of the Canyon's biological systems - they will not however effect [sic] its character as a World Heritage Site" (IUCN Review, March 1979).

3b) *Have there been significant changes in the authenticity or integrity of the property since inscription?*

NO

3b1) *If YES, please describe the changes to the authenticity or integrity and name the main causes.*

II.4 Management

(See Section 4 of the current Nomination Form and Section 2 and 4 of the original Form)

Management Regime

4a) How can the ownership/management of the property best be described? (Select all that apply.)

- management under protective legislation
- management under contractual agreement(s) between State Party and a third party
- management under traditional protective measures
- other

Please describe.

Grand Canyon National Park is owned by the United States Government on behalf of the American public. It is managed by the National Park Service, a federal agency. As a national park, it receives the highest level of conservation protection afforded by federal law in the United States. The park is also protected by the laws of the State of Arizona.

4b) Please indicate under which level of authority the property is managed

National

Please describe

Grand Canyon National Park is managed by the National Park Service, an agency within the U.S. Department of the Interior, a major division of the Executive Branch of the United States Government.

4c) Please describe the legal status of the property. For example, is it a national, provincial or territorial park? A national or provincial historic site?

The property is a national park, initially authorized by the U.S. Congress in 1919. It was enlarged in 1975 by congressional action to encompass approximately 1,218,375 acres (493,059 hectares). The United States Government owns, and the National Park Service manages, all land within the congressionally authorized boundary with the following exceptions: approximately 17,237 acres (6,976 hectares) are an inholding of the Navajo Nation; three parcels totaling approximately 393 acres (159 hectares) are privately owned; and approximately 11,860 acres (4,800 hectares)—the bed of the Colorado River through Grand Canyon National Park—are the property of the State of Arizona.

4d) Please provide the full name, address and phone/fax/e-mail of the agency(ies) directly responsible for the management of the property.

Contact #1

Agency Name: U.S. National Park Service, Grand Canyon National Park
First Name: Joseph
Last Name: Alston
Address: P.O. Box 129
City: Grand Canyon
State/Prov: Arizona
Postal Code: 86023-0129
Telephone: 928-638-7945
Fax: 928-638-7815
Email: joe_alston@nps.gov

4e) Please provide a list of key laws and regulations, which govern the protection and management of the cultural and natural resources of the property.

The following are United States federal statutes:

Antiquities Act, 1906 (16 USC 431 et seq.)

Act to Establish the National Park Service (Organic Act), 1916 (16 USC 1)

Act to Establish the Grand Canyon National Park, 1919 (16 USC 221 et seq.)

Wilderness Act, 1964 (16 USC 1131 et seq.)

National Historic Preservation Act, 1966 (16 USC 470 et seq.)

Clean Air Act, 1967, as amended (42 USC 7401–671)

National Environmental Policy Act, 1969, as amended (42 USC 4321 et seq.)

Act to Improve the Administration of the National Park System (General Authorities Act, 1970, as amended (16 USC 1a-5 et seq.)

Federal Water Pollution Control Act, 1972 (Clean Water Act), as amended (33 USC 1251 et seq.)

Endangered Species Act, 1973 (16 USC 1531 et seq.)

Grand Canyon Enlargement Act, 1975, as amended (16 USC 228a-j)

Resource Conservation and Recovery Act, 1976, as amended (42 USC 6901 et seq.)

American Indian Religious Freedom Act, 1978 (42 USC 1996 et seq.)

Archaeological Resources Protection Act, 1979 (16 USC 470aa et seq.)

National Parks Overflights Act, 1987 (Public Law 100-91)

Native American Graves Protection and Repatriation Act, 1990 (25 USC 3001 et seq.)

Grand Canyon Protection Act, 1992 (Public Law 102-575)

National Park Air Tour Management Act, 2000 (Public Law 106-181)

4f) Please describe the administrative and management arrangements that are in place for the property concerned, making special mention of the institutions and organizations that have management authority over the property and the arrangements that are in place for any necessary coordination of their actions. Make special reference, if appropriate, to the role of First Nations in managing the property.

Management authority for the site rests with the Superintendent of Grand Canyon National Park, who reports to the National Park Service Intermountain Regional Director, who reports to the Director of the National Park Service in Washington, D.C. Within the park, the Superintendent, assisted by a deputy, supervises chiefs of several divisions, including resource management (Science Center), interpretation and education, resource and visitor protection, administration, maintenance, concessions, and the project management team.

The management of the Colorado River's physical and biological resources within the park is influenced by several other entities through the Glen Canyon Dam Adaptive Management Program (AMP). Operation of Glen Canyon Dam, located a short distance upstream from the park boundary, profoundly affects riverine and riparian conditions in the park. The AMP is a federal, multi-stakeholder advisory committee initiated in 1996 to comply with provisions of the Grand Canyon Protection Act (Act) of 1992 (P.L. 102-575) and the Environmental Impact Statement and Record of Decision for the Operation of Glen Canyon Dam (completed in 1995). The AMP's purpose is to provide an organization and process for cooperatively integrating dam operations, downstream resource protection and management, and monitoring and research information. It is also dedicated to improving the values for which Grand Canyon National Park was established. The AMP members include the seven Colorado River basin states, federal and state agencies, and American Indian tribes, as well environmental groups, recreation interests, and power purchase contractors. The research and monitoring arm of the AMP is the Grand Canyon Monitoring and Research Center (GCMRC). GCMRC oversees flow experiments and monitors the impact of dam operations on downstream resources, including water quality, sediment transport and deposition, fish and other aquatic resources, the riparian ecosystem, cultural sites, and recreational activities.

Three American Indian tribes border park land: the Navajo Nation, the Havasupai Tribe, and the Hualapai Tribe. Park personnel coordinate with these tribes on management issues, such as protection of valued tribal resources within park

boundaries, regulation of backcountry or river recreationists who stray from park lands onto tribal property, and the use of park resources by tribal members. Grand Canyon National Park collaborates on management of recreational use of the lower 108 miles of the Colorado River with the Hualapai Tribe, and consults with the Havasupai Tribe on managing tribal use of a 95,300-acre (38,567-hectare) area within park boundaries. This area was designated Havasupai Traditional Use Lands by the Grand Canyon Enlargement Act of 1975. Park personnel confer with their tribal counterparts in both standing and ad hoc committee meetings and often address tribal council and local chapter meetings. The park also consults with more distantly located tribes who have traditional links with Grand Canyon to ensure that their concerns about traditional resources are considered in management decisions. Tribes sometimes participate in management processes as cooperating agencies and collaborate in research projects.

4g) Please also note whether there have been any significant changes in the ownership, legal status, contractual or traditional protective measures, or management regime for the World Heritage Site since the time of inscription.

Since the 1979 World Heritage Site inscription, protection of land within the park boundary has been expanded with the acquisition of almost 4,000 acres (1,619 hectares) of state and private inholdings and the retirement of grazing leases, mineral leases, and rights-of-way. The only significant change in resource management has been the creation of the Glen Canyon Dam Adaptive Management Program in 1996 as described in section 4f.

4h) Is there a management plan for the property?

YES

4h1) If YES, please summarize the plan, indicating if the plan is being implemented and since when, and the URL where the plan can be located, if available. (A copy of the plan should be submitted in December 2004. See Section 8)

Grand Canyon National Park operates in accordance with several management plans. Chief among them is the General Management Plan (GMP), which took effect in 1995 and provides the framework for all other plans. The GMP, which can be found online at <http://www.nps.gov/grca/gmp/>, states the park's purpose, significance, vision, and management objectives. It provides overall direction for the management of resources, visitor use, and general development for a 10- to 15-year period. The first-stated, of the plan's 65 management objectives, is to "Manage the park to preserve its integrity as a World Heritage Site with natural and cultural resources of national and international significance."

According to the GMP, all lands within the park are classified into one of three management zones: the Natural Zone, the Cultural Zone, or the Development Zone. Over 94% of parklands are managed as wilderness and classified within the Natural Zone, as are some undeveloped but relatively accessible areas on the South Rim. The Cultural Zone applies to hundreds of individual archeological sites, places of traditional cultural importance to American Indians, and historic structures. The Development Zone comprises less than 1% of the park and includes visitor and management facilities on the South and North Rims, a remote site on the northwest rim of the canyon (Tuweep), approximately 33 miles of cross-canyon corridor trails, and visitor and management facilities in the inner canyon at Indian Gardens and Phantom Ranch.

The GMP provides a blueprint for addressing the park's most pressing management issue: the crush of 4-5 million visitors who annually congregate in the relatively small developed areas, mostly on the South Rim. A summary of the GMP is presented in section 4n1. The GMP also provides guidance for the ongoing management of natural and cultural resources, and goals and objectives for visitor experience in the backcountry and Colorado River corridor. Specific provisions for managing scenic, ecological, and paleontological resources—values for which the park was inscribed as a World Heritage Site—include the following (all of which are in various stages of implementation):

(1) Components of the human environment that adversely affect scenic resources will be identified; the National Park Service will work with the necessary entities to minimize such intrusions. Overlooks will be maintained for resource protection and scenic quality. Air quality and visibility in the park will be improved by cooperatively reducing in-house and external emission sources. The intent is to improve the visitor experience at overlooks during the day and add to the enjoyment of the night sky.

(2) The National Park Service will develop and implement an ecosystem approach to managing threatened and endangered species, and will institute an active research and recovery program.

(3) A vegetation management program will be developed and implemented, focusing on revegetating disturbed areas, reestablishing native landscaping, removing nonnative species, and using low-impact techniques to manage overlooks and vistas.

(4) The natural role of fire within park ecosystems will be restored within the constraints specified in the park's Fire Management Plan.

(5) A cave management plan will be developed that will include specific standards, indicators, monitoring programs, and methodology for addressing problems if standards are not met. [Caves contain some of the park's most significant paleontological and cultural resources. Pursuant to this GMP directive, a draft Cave and Karst Management Plan was completed in 1998.]

Plans for managing visitor use are described in Section 4n1. Specific plans for managing resources are listed below (only the draft wilderness plan is available online):

- (6) Resource Management Plan (1997)
- (7) Fire Management Plan (1995, amended 1998; currently being revised; expected completion date 2004)
- (8) Draft Cave and Karst Management Plan (1998)
- (9) Draft Wilderness Management Plan (1998; finalization pending completion of the Colorado River Management Plan):
<http://www.nps.gov/grca/wilderness/draftwmp.htm>

4h2) If NO, is a management plan under preparation or is preparation of such a plan foreseen for the future?

Financial Resources

4i) What is the annual operating budget for the property in the current fiscal year? (For sites consisting of more than one property provide the budgets of constituent parts.)

In fiscal year 2003, Grand Canyon National Park appropriations totaled \$20,120,910 USD. Of this, \$18,824,900 USD comprised base appropriations and \$1,296,010 USD comprised additional appropriations.

Sources of Expertise and Training in Conservation and Management Techniques

4k) Please describe any sources of specialized expertise, training, and services that come from sources off-site (e.g., training centers, museum conservation facilities).

Grand Canyon National Park employees take advantage of the National Park Service's Training and Development Program, which offers hundreds of classroom-based, computer-based, and television-based training courses, as well as workshops and symposia. Some distance-learning courses are available over the Internet; others are real-time, interactive courses delivered via satellite feed to on-site stations. All new employees are required to complete a five-part program in the fundamental, universal competencies expected of all National Park Service employees. More specialized learning opportunities are available in the areas of supervision; management and leadership; administration and office management support; information management; cultural resources stewardship; historic preservation skills and crafts; planning, design and construction; natural resources stewardship; interpretation, education, and cooperating associations; recreation and conservation programs; visitor use management; law enforcement and resource protection; fire and aviation management; facility maintenance; and several specialty fields. A catalog of current course offerings and training events is available online at <http://www.nps.gov/training/pdf/2003-catalog.pdf>.

National Park Service training facilities include the Horace M. Albright Training Center (located within Grand Canyon National Park), Stephen T. Mather Training Center, the Historic Preservation Training Center, Capital Training Center, and the NPS/Federal Law Enforcement Training Center. Through partnerships with other agencies and institutions, National Park Service employees are encouraged to take advantage of programs offered at such facilities as the Arthur Carhart National Wilderness Training Center, the Olmsted Center for Landscape Preservation, and the National Interagency Fire Center. Sources of off-site expertise and specialized services include the National Park Service's Harpers Ferry Center, which provides a variety of services, including interpretive planning, conservation of objects, audiovisual equipment repair, graphics research, replacement of wayside exhibits, and the revision and reprinting of publications. Regional archeological centers, including the Western Archeological Center in Tucson, Arizona, offer curatorial facilities for artifacts and expertise in artifact preservation. Additional technical assistance for the care and management of museum collections is provided online by the National Park Service's Archeology and Ethnography Program, which also sponsors courses on how to incorporate ethnography into park planning, management, and interpretation. Online aids provided to employees by the National Park Service include technical publications, searchable databases, notification about learning opportunities both within and outside the agency, and Internet links to related Web sites.

4j) Please provide information about the number of staff working at the World Heritage Site (enter figures).

Full Time: 421 (Value must be a number)
Part Time: 32 (Value must be a number)
Seasonal: 69 (Value must be a number)
Other: 40 (Value must be a number)

Please list the job categories of these staff (e.g., Park Superintendent, Historian, Ecologist, Interpreter, General Works/Maintenance Manager) and describe the specialized skills and expertise of the World Heritage Site's staff members.

Senior management positions include park superintendent and deputy superintendent, science center director (responsible for natural and cultural resource management), and division chiefs in the areas of interpretation, resource and visitor protection (law enforcement), administration, concessions, maintenance, and project management. The senior managers supervise program managers, coordinators, park rangers (interpretive and protective), and other specialists who have expertise in numerous subjects, including, but not limited to, wildlife biology, vegetation, air quality, geology, hydrology, history, archeology, recreation, planning, engineering, education, technical writing/editing, librarianship, museum curation, information technology, emergency services, fire management, aviation, whitewater boating, budgeting, human resources, public relations, and a plethora of construction and maintenance skills.

Visitation

4l) Are there any visitor statistics for the site?

YES

4l1) If YES, please provide the annual visitation for the most recent year it is available, indicating what year that is, a brief summary of the methodology for counting visitors, and briefly describe the trends in visitation. (In describing these trends, please use the year of inscription as a baseline.)

2002 Annual Visitation: 4,339,139

Over 95% of visitors enter Grand Canyon National Park by highway vehicle (primarily automobile and bus). Vehicles are counted as they enter the park at two staffed entrance stations on the South Rim and one on the North Rim, and at Tuweep, a remote site at the end of a 60-mile (100-km) unpaved road. Inductive loop traffic counters are used at the entrance stations, and a remote sensor traffic counter is used at Tuweep. The traffic count is reduced by the number of buses (bus passengers are recorded by personnel at the entrance stations) and multiplied by a persons-per-vehicle (PPV) multiplier. The PPV varies by location and month. Just over 4% of visitors enter via the Grand Canyon Railway, which submits a tally of its passengers to the park. The remaining visitors enter the park by boat on the Colorado River. They are counted by the number of noncommercial permits issued at the launching point (Lees Ferry in Glen Canyon National Recreation Area), just upstream of the park boundary, and data supplied by the concessioners who operate guided river trips. On average, between 22,000-23,000 recreationists participate in river trips each year.

In the year Grand Canyon National Park was inscribed as a World Heritage Site (1979), 2,275,712 people visited the park. By 2002, that number had increased by over 90%, although growth has not been constant. Annual visitation more than doubled between 1979 and 1993 (to 4,928,5090); remained largely flat over the remainder of the 1990s; then declined each year from 2000 to 2002, with a total drop of 12% over that three-year period. Train service was restored to the park in 1989 (after an absence of 20 years), and the number of visitors using that mode to reach the park has increased almost every year since then, growing by 10% between 2000 and 2002. River-based recreation (e.g. river running) in the park increased by about 83% between 1979 (12,000 people/yr) and 1990 (22,000 people/yr) but has remained essentially static since then because of limits mandated in the park's 1989 Colorado River Management Plan. That plan is currently being revised and the use limits re-evaluated in the context of a National Environmental Policy Act (NEPA) environmental impact analysis.

4m) Please briefly describe the visitor facilities at the property.

The park's basic visitor facilities are scenic drives and overlooks on the South and North Rims, an overlook at Tuweep, a system of pedestrian/bicycle paths along both rims and through forest habitats, a number of primitive roads to scenic overlooks (primarily on the North Rim), and approximately 500 miles (800 km) of mostly primitive trails within the canyon. The South Rim and Tuweep areas are open year-round, but the North Rim is closed during the winter. Low visitation at the North Rim area that time of year does not justify staffing visitor facilities or clearing the roads of snow. The North Rim is a 215-mile (358-km) drive from the South Rim and far from heavily traveled routes.

Facilities within the park that meet utilitarian visitor needs include campgrounds, laundries and showers, eight lodges and an RV park, restaurants, gift shops, bookstores, general stores, bank, post office, service stations (auto repair and fuel), medical clinic, and a shuttle bus transit system. Overnight lodging and a campground are available at historic Phantom Ranch and a campground is available at Indian Gardens, the only two developed facilities located within in the inner canyon. Located on the cross-canyon trail corridor and near the Colorado River, Phantom Ranch is accessible only by foot, mule, or boat. During the high-use season (summer), the demand for many of these services exceeds availability. Advance reservations are required for lodges, campgrounds, mule rides, and guided river trips. Long lines are common at eateries and some shuttle bus stops. The failure of visitor services to keep pace with demand reflects National Park Service policy to constrain development within parks. Federal legislation has mandated that resource protection is the National Park Service's primary responsibility.

With the exception of the campgrounds, bookstores, and medical clinic, the facilities described here are operated by concessioners under contract to the National Park Service. Mule rides into the canyon and multi-day whitewater raft trips on the Colorado River are also provided by concessioners. If individuals do not wish to use a commercial outfitter, they may obtain permits from the National Park Service to run the river on their own. Because river use is capped and demand is high, the waiting list for such permits is very long. Other than a few amenities at Phantom Ranch, no facilities are provided along the entire 277-mile (416-km) length of the Colorado River in Grand Canyon. River runners must meet all their own needs and carry out all wastes. Overnight backcountry hiking and camping is by permit only. Primitive campgrounds with latrines are provided on the most popular trails, but no facilities are available on remote, lightly used trails.

Orientation/interpretive facilities and services, which provide information about what visitors see and experience in the park, are described in section 4t.

4n) Is there tourism/visitor management plan for the property?

YES

4n1) If YES, please briefly summarize the plan, and provide a URL where the plan can be located.

The General Management Plan (GMP) functions as the primary tourism/visitor management plan for the park. Provisions are made for improving visitor use patterns, access and transportation, orientation and interpretation, and other visitor services. It is the park's vision that the South Rim will continue to be the focus of most park visitation but without the vehicle and pedestrian congestion that has degraded visitor experience since the 1970s. The core concept for achieving this end is to exclude (during peak seasons) private vehicles from the most heavily visited areas and to make greater use of public transit: initially buses, eventually buses and light rail. Three new transit/orientation centers within the park are critical components of the shift to public transit, as is a planned transportation hub in the small gateway community of Tusayan, south of the park. When the Tusayan transportation hub is completed, visitors will leave their private vehicles there and enter the park by public bus or rail. They will be delivered to the main transit/orientation center (Canyon View Information Plaza) or to Grand Canyon Village. The Canyon View Information Plaza was the first major component of the plan to be built, opening to the public in 2000. A second transit/orientation center is under construction at the east entrance to the park, and a third center is planned for the North Rim.

Another key element of the GMP is the adaptive reuse of several historic buildings within Grand Canyon Village to create a Heritage Education Campus. The buildings will be rehabilitated to provide facilities for in-depth educational exhibits interpreting the geology, natural and human history, and American Indian cultures of the park. Additional educational programs and facilities will include art displays, living history demonstrations, music and dance presentations, a learning lab, and facilities for classes, conferences, and meetings. Functions currently housed in these buildings will be moved to new facilities away from visitor areas.

A third key element is the development of a Greenway -- 73 miles (122 km) of additional paths on the South and North Rims designed for nonmotorized use. New paths will run along the rim and connect existing paths, overlooks, inner canyon trailheads, a regional trail system, and various visitor facilities. Some portions will be paved, while others will be unpaved and suitable for equestrian use as well as pedestrians and cyclists. The first two phases, of a three-phased implementation program, have been completed, and the third is underway.

A fourth element calls for increasing overnight lodging by about 25% by adaptively reusing existing structures, and increasing the total number of campsites by about 18%.

The Comprehensive Interpretive Management Plan (2002) describes how guidance set forth in the GMP for interpretive services will be implemented over a 5- to 10-year period. It divides the developed areas of the park into four Interpretive Districts, and for each district outlines a core interpretive program and identifies available interpretive assets. The plan also identifies parkwide and location-specific interpretive themes. It provides future direction for environmental education, school programs, park publications, and a parkwide project for updating over 120 wayside exhibits.

The Backcountry Management Plan and the Colorado River Management Plan provide guidelines for managing visitors who hike the park's inner canyon trails and run the Colorado River, respectively. These plans address use limits, procedures for obtaining permits, safety issues, and rules for backcountry and river use. To protect natural and cultural resources in the park, and to help ensure a primitive recreational experience for those who venture out of developed areas, limits have been set on the number of people who may camp in the backcountry at any one time. The National Park Service also caps river use, and apportions that use between commercial outfitters and private permit holders.

All these visitor management plans are available online:

- (1) General Management Plan: <http://www.nps.gov/grca/gmp/>
- (2) Comprehensive Interpretive Plan (2002):
<http://www.nps.gov/grca/publications/lrip.htm>
- (3) Colorado River Management Plan (1989, currently being revised, expected completion date 2004):
<http://www.nps.gov/grca/crmp/documents/89crmp/89crmp.htm>
- (4) Backcountry Management Plan (1988, revisions scheduled to begin late 2004): <http://www.nps.gov/grca/wilderness/backcountry.htm>

Scientific Studies

4o) Please list key scientific studies and research programs that have been conducted concerning the site. (Please use the year of inscription as a baseline.)

Grand Canyon National Park is a natural laboratory and has been the site and subject of numerous research projects since 1979. A sense of the scale of the amount of work done is provided by an online bibliography of Grand Canyon publications (<http://www.grandcanyonbiblio.org/search/>), which lists 154 masters degree theses and 160 doctoral dissertations completed since 1979. Another Web site, operated by the National Park Service (<http://science.nature.nps.gov/permits/servlet/IarFormSearch>), lists 587 annual reports submitted since 1991 for research and monitoring projects permitted within Grand Canyon National Park. Disciplines covered include geology, geomorphology, paleontology, biology, ecology, fisheries, forestry, hydrology and air quality, as well as archeology, ethnography, recreation, public resource management, and other social science topics. Six "research natural areas" have been designated in the park (8,845 acres, 3,579 hectares total) to provide opportunities for nondestructive research in areas relatively uninfluenced by humans.

The Colorado River has increasingly become the focus of research in Grand Canyon. It is one of the most intensively studied riverine systems in the world. A multidisciplinary research and monitoring program was initiated in 1982 by the U.S. Bureau of Reclamation to gather data on the effects of Glen Canyon Dam operations on downstream natural, cultural, and recreation resources. This program has been continued by the Grand Canyon Monitoring and Research Center (GCMRC) of the U.S. Geological Survey, an arm of the Glen Canyon Dam Adaptive Management Program. Research has included several experimental flow releases from the dam to test effects on primary productivity, the aquatic food base, native and nonnative fishes, backwater habitats, riparian vegetation, sediment budget, geomorphic processes, and numerous other attributes of the river corridor. Data collected have been used to develop and calibrate conceptual and simulation models, including the highly integrated Grand Canyon Ecosystem Model. Information about GCMRC programs can be found at <http://www.gcmrc.gov/>.

Other research programs are conducted in association with the Colorado Plateau Field Station (administered by the U.S. Geological Survey), and with the Colorado Plateau Cooperative Ecosystem Studies Unit (based at Northern Arizona University in Flagstaff, Arizona). Cooperative investigations with these organizations have addressed endangered bird and plant species, paleoecology, and wildland fire modeling, among other topics. In another partnership, the Grand Canyon National Park Foundation (a nonprofit support group) underwrites and recruits volunteers and interns for studies on the reintroduction of certain extirpated native species, control of invasive plant species, and wildlife abundance.

4o1) Please describe how the results of these studies and research programs have been used in managing the World Heritage Site.

Much of the research conducted within the park has a great deal of practical application and direct bearing on resource management. The intent of all research conducted by GCMRC, for example, is to inform dam management decisions. As a result of scientific studies, large fluctuating dam releases designed to maximize hydroelectric power production were curtailed in the early 1990s. High fluctuations promoted the erosion of sand bars and loss of fine sediment from the river corridor in Grand Canyon. Experimental dam releases have recently been used to rebuild camping beaches, restore backwater habitats needed by young native fish, and suppress the reproduction of nonnative fish that prey on and compete with native species. The Grand Canyon Ecosystem Model is being used to design and evaluate monitoring programs in the river corridor. As the model becomes more sophisticated, it will increasingly be used to guide management options.

Results of research have influenced many other efforts to protect the park's natural and cultural resources while providing public access. Examples include: studies of the ecological harm caused by feral burros in the park justified their eventual removal; aircraft noise data collection resulted in legislation restricting flights over Grand Canyon; air quality research conducted in Grand Canyon helped to identify a specific source of pollutants and led to the installation of pollution control devices on a regional power plant; forestry research is helping park managers evaluate and refine techniques, including wildland fire management and mechanical treatments, for improving forest ecosystem health; sociological studies of river runner experience are being used to develop and evaluate alternatives for managing recreation on the Colorado River; and, in a newly initiated program, data collected on habitat attributes of selected streams within the canyon will be used in a program to benefit native fish assemblages in those streams.

4o2) What role, if any, has the property's designation as a World Heritage Site played in the design of these scientific studies and research programs? For example, has there been a specific effort in these programs to focus on the recognized World Heritage values of the property?

Grand Canyon National Park's designation as a World Heritage Site has had no direct role in the design of research programs at the site; however, the values for which the park was inscribed have been the subject of hundreds of studies.

Education, Information and Awareness Building

4p) Is there a plaque at the property indicating that it is a designated World Heritage Site?

YES

4q) Is the World Heritage Convention logo used on all of the publications for the property?

NO

4r) Are there educational programs concerning the property's World Heritage values aimed at schools?

YES

4r1) If YES, please briefly describe these programs.

Grand Canyon National Park offers five curriculum-based programs for elementary school children: Dynamic Earth (geology), Abbreviated Dynamic Earth, Stories in Stone (paleontology), Discovery Pack (natural history), and Rails and Tails (human history). All programs are conducted at the park, but interpretive rangers are available to visit classrooms and talk to students before the outing. To prepare teachers, and to provide suggestions for pre-visit and post-visit classroom activities, several teacher workshops are held at the park each year. In a separate program (although they are sometimes combined), "traveling trunks" (full of educational materials) and videos are available for loan to schools. Trunks contain a lesson plan, books, videos, posters, maps, and other relevant materials. Subjects include geology, ecology, and human history. These materials are provided without charge by the Grand Canyon Field Institute, a nonprofit organization that works closely with park personnel to provide experiential and other types of educational opportunities for the public. Both the curriculum-based and traveling trunk programs meet Arizona state academic and national science education standards. Park personnel also visit nearby schools to conduct hands-on environmental education activities and work with the Grand Canyon community school to organize Earth Day activities. In a program aimed at older students, the park cooperates with Northern Arizona University in offering the Grand Canyon Semester, an integrated learning experience. Park staff deliver guest lectures and students participate in research projects within the park. At the most advanced level, the Grand Canyon National Park Foundation sponsors a competitive summer internship program that offers top-level graduate students from around the world an opportunity to work on key research projects at Grand Canyon National Park.

4s) Are there special events and exhibitions concerning the property's World Heritage values?

YES

4s1) If YES, please briefly describe them.

Examples of special events concerning the values for which Grand Canyon National Park was designated include a guest lecture series in which regional scientists were invited to address the public in the park's outdoor amphitheater. Topics included volcanism in the park, Grand Canyon birds, and the Colorado River ecosystem. In 2000, a Grand Canyon Geology Symposium focused on the Cenozoic evolution of the Colorado River and origin of the Grand Canyon. In 1999, a GCMRC science symposium focused on impacts of Glen Canyon Dam operations. In a recurring special event, the public is invited each autumn to join members of Hawkwatch International as they record the annual hawk migration over Grand Canyon. Over 10,000 hawks have been recorded in some years.

Special exhibitions in the park have focused on celebrating the canyon's spectacular scenery as captured in photography, painting, and other art forms. These exhibitions are mounted in Kolb Studio, a refurbished historic structure perched on the edge of the canyon overlooking the Bright Angel Trail. Some of the exhibitions include public lectures.

4t) Please briefly describe the facilities, visitor center, site museum, trails, guides and information material that are available to visitors to the World Heritage Site.

Facilities providing information about park resources and programs include the newly constructed Canyon View Information Plaza. This indoor/outdoor facility is the hub of visitor activity at the South Rim and includes a spacious plaza, an orientation building with displays, outdoor information kiosks and interpretive exhibits, a bookstore, restrooms, and bus transit connections. Additional information centers on the South Rim include Kolb Studio and Lookout Studio in the Grand Canyon Village Historic District (see Section 4s1); Yavapai Observation Station; and the Desert View Information Center, which is located in the Desert View Watchtower. Constructed in the 1930s, the watchtower emulates prehistoric Puebloan architecture and features wall and ceiling paintings by an eminent Hopi artist. An additional information center is located on the North Rim.

Information about resources in Grand Canyon National Park is provided in over 120 wayside exhibits scattered throughout the developed areas of the park. The Tusayan Museum, located on the South Rim, interprets the prehistoric American Indian cultures of the area, displays representative artifacts from the park, and offers a self-guided tour of an adjacent 800-year-old, 15-room Puebloan ruin. An outdated, multidisciplinary museum in the park's old South Rim visitor center was recently closed. It will be replaced by permanent and revolving museum exhibits in the Heritage Education Center. In the meantime, visitors may view geological specimens in the Yavapai Observation Station and historical artifacts in the Bright Angel Lodge in the Village Historic District. Museum collections and archives not on display (approximately 318,000 items) are curated in the park and may be visited by appointment. A park library (12,000 volumes and multimedia items) is open to the public.

Visitors entering the park receive a publication (named "The Guide") that provides basic information about the park and is available in several languages. Also available, without charge, are an accessibility guide, a Junior Ranger booklet for children, and trip planners. Easily reproduced handouts called Site bulletins are distributed at many locations in the park. They address a number of timely topics, issues, managerial challenges, or seasonal information. Special-topic, multi-fold brochures are available for loan or purchase at various points of interest. A large selection of pertinent publications, maps, posters, videos, and other materials are on sale at visitor centers and in concession-operated lodges and shops. The Grand Canyon Association, a nonprofit support organization, provides publications for the park and operates its bookstores.

In the most in-depth program for imparting information to visitors, interpretive rangers lead walks and deliver evening talks on a wide range of topics, including geology, ecology, endangered species, air quality, and many more. This program is offered at the South and North Rims and at Phantom Ranch on the floor of the canyon. The Grand Canyon Field Institute, a division of the Grand Canyon Association, offers over 50 educational programs in partnership with the park. These are primarily backcountry treks led by trained geologists, biologists, archaeologists, and other experts in Grand Canyon natural and cultural resources.

All of Grand Canyon's over 500 miles (800 km) of trails and paved paths are open to the public. Most day use is on rim paths, which often feature informative wayside exhibits. Some interpretive signs are also posted along the cross-canyon corridor trails. These trails total about 33 miles (55 km) and are the most heavily used trails in the inner canyon. No interpretation is provided on the other hiking trails, which are managed to provide a wilderness experience.

4u) What role, if any, has the property's designation as a World Heritage Site played with respect to the education, information and awareness building activities described above? For example, has the World Heritage designation been used as a marketing, promotional, or educational tool?

The National Park Service is proud of Grand Canyon National Park's status as a World Heritage Site and believes that this designation reinforces and promotes the value of the site in the eyes of the public, legislators, and other public officials. Such esteem increases the likelihood that efforts to protect the park's resources will receive public and official support, and that more people will be encouraged to visit the park. To bring attention to this honor, the World Heritage Site designation is mentioned regularly and prominently in publications, press releases, exhibits, interpretive programs, school programs, Web sites, and management documents.

II.5 Factors Affecting the Property
(See Section 5 of the current Nomination Form)

5) Please briefly identify factors affecting the property under the following headings: Development Pressures, Environmental Pressures, Natural Disasters and Preparedness, Visitor and Tourism Pressures, Number of Inhabitants Within Property and Buffer Zone and Other - major factors likely to affect the World Heritage values of the property. First discuss those that were identified in the original nomination, in the same order in which they were presented there, then those that have been discussed in reports to the World Heritage Committee since inscription, and then other identified factors.

This section should provide information on all the factors which are likely to affect a property. It should also relate those threats to measures taken to deal with them, whether by application of the protection described in Section 4e or otherwise.

Not all of the factors suggested in this section are appropriate for all properties. The list provided is indicative and is intended to assist the State Party in identifying the factors that are relevant to each specific property.

(In describing these trends, please use the year of inscription as a baseline.)

For EACH Factor, please specify the following:

key actions taken to address factor

any plans that have been prepared to deal with factor in the future

whether the impacts of factor appears to be increasing or decreasing, and the timeframe for which the comparison is being made.

Development Pressures

5a) Provide information about Development Pressures on the following: demolitions or rebuilding; the adaptation of existing buildings for new uses which would harm their authenticity or integrity; habitat modification or destruction following encroaching agriculture, forestry or grazing, or through poorly managed tourism or other uses; inappropriate or unsustainable natural resource exploitation; damage caused by mining; and the introduction of invasive nonnative species likely to disrupt natural ecological processes, creating new centers of population on or near properties so as to harm them or their settings.

Factor: Urban Development and Effects on Groundwater

In general, there is little urban development in the area immediately surrounding Grand Canyon National Park; however, growth is taking place on parcels of private land along the highway leading to the park's south entrance. Rapid growth is also occurring in larger communities 60 miles (100 km) or more south of the park. The major concern associated with development throughout this region is groundwater pumping. Increasingly, deep wells (up to 4,000 ft/1,219 m deep) are being drilled to obtain water from the largest aquifer in the area. That aquifer also feeds most of the seeps and springs on the South Rim of the Grand Canyon. These seeps and springs, and the streams that emanate from them, are critical resources for many of the park's endemic plant and wildlife species. One of the streams is essential for the survival of the largest remaining population of an endangered species of fish. Impacts of pumping on Grand Canyon springs have yet to be confirmed, but could adversely affect the values under natural criterion (iv). It is difficult to prove that changes in discharge at a given spring are the result of pumping at a particular well several miles away. Even if groundwater pumping is shown to be detrimental to springs in Grand Canyon, park managers have little recourse unless that pumping is also shown to affect a listed species. In that case, provisions of the federal Endangered Species Act could be brought to bear. Currently, the park is monitoring seeps and springs on the south side of the canyon. This work is being conducted in association with nonprofit environmental organizations, Northern Arizona University, and the U.S. Geological Survey. These entities are also collaborating on regional groundwater studies and workshops to address the issue on a regional basis.

The effects of groundwater pumping on Grand Canyon water resources became a concern in 1989 when the first well was dug in Tusayan, a small tourist community located about two miles from the south entrance to the park. Since then, additional deep wells have been dug there and in more distant communities to the south. The major city in northern Arizona (Flagstaff), which has a population approaching 60,000, is investigating the possibility of tapping the aquifer as well. The pressure on Grand Canyon resources from this activity is increasing as the demand for water in this semi-arid region continues to grow.

Factor: Operation of Glen Canyon Dam

Construction of Glen Canyon Dam in 1963 altered the flow regime, temperature, and sediment load of the Colorado River through Grand Canyon. Since that time, operation of the dam as a water storage and hydropower facility has determined the flow characteristics of the river. Sediment-starved, fluctuating flows have made the river highly erosive, with a resulting net loss of fine sediment from the river corridor. Camping beaches and substrate for riparian vegetation are being lost. Year-round, cold, hypolimnetic dam releases and clear water conditions have disadvantaged native fish species that evolved in a turbid desert river with warm seasonal water temperatures. These altered conditions, combined with large numbers of nonnative fish species that compete with and prey on native fish, have led to the eradication of half of the eight native species that once inhabited the Colorado River in Grand Canyon and adversely affected the values under natural criterion (iv). Two of these species, both federally listed as endangered, were thought, or known, to exist in the river in 1979, albeit in very small numbers. Since then, one species (Colorado pikeminnow) is officially considered extirpated, and the other (razorback sucker) is likely extirpated. One of the four remaining native species (humpback chub), also federally listed as endangered, appears to be suffering from sharply declining numbers.

Efforts to mitigate the impacts of the dam are described in sections 4f, 4o, 4o1, and 6a1. They include 20 years of intensive research and monitoring and an altered dam-release scenario that has curtailed high fluctuating flows. Experimental, short-term dam release programs have been implemented to promote sediment storage in the system, rebuild beaches, rehabilitate backwater habitats, enhance recruitment of native fish, and suppress recruitment of nonnative fish. Several studies, an environmental assessment, and formal discussions among experts from many fields have explored the advisability of installing a temperature control device on the dam to increase water temperature for the benefit of the humpback chub and other native species. That management action is still under consideration and may be implemented if the potential advantages are judged to outweigh potential disadvantages. Future plans include continuation and refinement of the Grand Canyon and Monitoring and Research Center (GCMRC) monitoring programs described in section 6a1. As required by the Grand Canyon Protection Act (1992) and the Record of Decision for the Environmental Impact Statement for the Operation of Glen Canyon Dam (1995), Glen Canyon Dam will continue to be managed in such a way as to mitigate adverse impacts on the values for which Grand Canyon National Park was established. Guidance is provided by the Glen Canyon Dam Adaptive Management Program Strategic Plan (2001), the GCMRC Long-Term Monitoring and Research Strategic Plan (1997), and annual GCMRC workplans.

Given these efforts, the rate of adverse effects of dam operations on some natural resources of the Colorado River has slowed since high fluctuating flows were terminated in 1992, while the rate of adverse effects on other resources has increased. Population estimates for the endangered humpback chub suggest a 50% decline in abundance since 1990, and the size and number of camping beaches continues to decrease. The continued net loss of sediment from the system is probably inevitable without artificial augmentation.

Factor: Uranium Mining

The mining of uranium on lands adjacent to Grand Canyon National Park poses a potential threat to the aquatic and riparian resources of at least two streams that drain into the park. Uranium-rich geological features called "breccia pipes" occur throughout the Grand Canyon area, and at least 10 have been actively mined for uranium or have undergone preliminary development for mining. Mining accelerated through the 1980s and continued into the 1990s, when several mines were depleted. Four still contain mineral deposits but were shut down in 1999 because of depressed commodity prices. Both these and new mines could be activated in the future if prices justify the cost. The concern about radioactive contamination of waterways draining into the park was heightened in 1984 when a flash flood caused a spill of uranium mine tailings into a tributary system of the Colorado River. The spill was cleaned up, but storm flood flows in the tributary (Kanab Creek) have continued to register high radionuclide levels.

The principal protection against contamination from future off-site mining come from federal and state environmental laws and regulations. Resumption of mining at existing sites, and all new mining ventures, would have to conform to provisions of numerous laws, including the Resource Conservation and Recovery Act which provides for comprehensive cradle-to-grave regulation of hazardous waste. The State of Arizona instituted a Aquifer Protection Program (APP) permit system in the early 1990s. Three of the four active uranium mining projects suspended in 1999 were denied APP permits. Operations at each mine would have to be revised sufficiently to acquire the permit before mining could resume. To stay informed of possible radioactive contamination from natural or mine-related sources, the park monitors water quality in selected tributaries. Cleanup of any future spills would be handled by the U.S. Environmental Protection Agency under the aegis of the Comprehensive Environmental Response, Compensation, and Liability Act.

The only uranium mine within the park boundary, a privately owned property known as the Orphan Mine, ceased production in 1969 and the federal government obtained full title to the property in 1987. Radioactive and other hazardous substance contamination is present at the site. The National Park Service is currently taking actions to assess the extent of this contamination so that appropriate cleanup action can be implemented. With the acquisition of the Orphan property, the threat of mining within the park was greatly reduced. One privately owned parcel with known mineral potential (asbestos) remains within park boundaries; however, mining at the site would be impracticable and is not considered a serious threat.

Factor: Livestock Grazing

Livestock occasionally trespass onto park lands from adjacent property located in the western portion of Grand Canyon. Some impacts do occur to ecosystem values in those areas as a result. Effects from grazing have been substantially reduced since 1979. At that time, livestock grazing was allowed on certain parcels because of pre-existing leases for property added to the park in 1975. All such leases have now expired and grazing is no longer authorized in the park. To reduce the amount of trespass by cattle and other livestock, park managers replace old and damaged boundary fencing on an ongoing basis.

Environmental Pressures

5b) Environmental pressures can affect all types of property. Air pollution can have a serious effect on stone buildings and monuments as well as on fauna and flora. Desertification can lead to erosion by sand and wind. What is needed in this section is an indication of those pressures which are presenting a current threat to the property, or may do so in the future, rather than a historical account of such pressures in the past.

Factor: Air Quality

The air quality at Grand Canyon National Park is generally good; in fact, air quality in the region ranks among the nation's best. The park is a "Class I Area" under the Clean Air Act, providing the greatest degree of protection from increases in air pollution. Nonetheless, regional haze does impair visibility at the park, with the degree of impairment depending on atmospheric conditions. At times, the haze is very evident to visitors; at others, it is not noticeable at all. Non-natural sources of regional haze include urban and industrial emissions, mostly from distant metropolitan areas in California, Nevada, and Arizona. Emissions from northern Mexico have been implicated as well. Much of the haze is attributed to sulfates from fossil fuel combustion; power plants, smelters, and urban traffic are the primary offenders. Fugitive dust and smoke from wild and prescribed fires contribute to a lesser extent. Local sources of air pollution in northern Arizona include mobile emissions (primarily automobile), a nearby coal-fired power plant, dust, and (sporadically) smoke. While levels of some pollutants are high enough to affect visibility, they remain well below levels set by federal and state health standards. Levels of ozone are sufficiently high, however, to potentially affect sensitive plants within the park.

The air quality at Grand Canyon National Park was first monitored in the 1950s. These efforts were expanded in the 1980s, and the park is now one of the most intensely monitored rural areas of the nation. Instrumentation includes transmissometers to measure visibility, aerosol samplers, wet and dry deposition samplers, continuous ozone monitors, ultraviolet radiation monitors, dioxin/furan samplers, meteorological measuring instruments, and automatic camera systems. Data from monitoring and research programs have helped to spur action: in 1990, Congress passed an amendment to the Clean Air Act that created a commission to study the interstate transport of air pollutants into the Grand Canyon area. The commission's recommendations are currently being implemented by a partnership of federal agencies and western states and tribes. Milestones have been established for reducing regional sulfate emissions over the long term, and the first state plans for achieving those milestones are expected in 2003-2008. In more specific actions, Navajo Generating Station, the principal local source of sulfates, was compelled to install pollution control devices on its stacks by 1999. A second, more distant power plant must follow suit by 2006.

The National Park Service has implemented several measures to reduce air pollutants originating from within the park. They now conduct inventories of emission sources within the park, and have confirmed that wildland fires and mobile sources, especially automobiles, are the heaviest polluters. To address this problem, the General Management Plan calls for a major shift from private vehicle use to public transit. The park is expanding and reconfiguring its transit system and replacing diesel buses with alternative fuel models. In-park tour buses have been retrofitted with hydrous alcohol injection systems and throttle controls that result in cleaner emissions and better fuel efficiency. Fuel oil boilers in buildings and residences have been replaced by clean-burning propane boilers. All two-stroke engines on motorized river rafts have been replaced by low-emission, four-stroke engines. Prescribed fires used to reduce hazardous fuel loads and restore forest health are conducted in accordance with stringent protocols under permits from the state, ensuring coordination with other land management agencies to minimize air quality impacts.

It is not clear how effective these measures have been. Trends are mixed. Between 1990 and 1999, sulfate and nitrate ion levels improved (i.e. decreased). Measurements of sulfate ion deposition showed significant improvement. Measurements of ozone, however, showed significant degradation (i.e. increased). Visibility on the best days has not changed appreciably since 1990, but visibility on the worst days has degraded.

Natural Disasters and Preparedness

5c) This section should indicate those disasters which present a foreseeable threat to the property and what steps have been taken to draw up contingency plans for dealing with them, whether by physical protection measures or staff training. (In considering physical measures for the protection of monuments and buildings it is important to respect the integrity of the construction.)

Factor: Potential for Destructive Wildfire

Natural disasters are unlikely to have a negative effect on the values for which Grand Canyon National Park was inscribed as a World Heritage Site; however, destructive wildfire is a concern. The natural fire ecology of forests in the park and in neighboring areas has been disrupted by a century of wildland fire suppression. As a result, heavy fuels (dense stands of small-diameter trees, dead wood, dense understory vegetation) has built up, increasing the probability of a high-intensity, difficult-to-control wildfire. High-intensity fires have the potential to alter the ecological attributes of the affected area for many years.

To reduce the likelihood of destructive fires, Grand Canyon National Park is attempting to reduce fuel loads in the park's forests and to reintroduce a more natural fire regime. Methods for achieving these ends include prescribed fire (where fire is intentionally ignited and managed for resource benefit), the use of naturally caused wildland fire for resource benefit, and mechanical treatments. In wildland fire use, lightning-caused wildland fires are allowed to burn provided specific criteria are met that ensure the protection of human life, sensitive resources, and developed property. The park has plans, trained personnel, and equipment in place to manage desirable fire and to suppress unwanted fire. If additional help is required, the National Park Service is an active participant in multi-agency fire management networks that can allocate regional and national resources wherever they are most needed.

Guidance for the use and management of fire is provided by the Grand Canyon National Park Wildland Fire Management Plan (1995) and the Fire Management Plan Amendment (1998). Preparation of a new fire management plan and environmental impact statement is now underway. Completion is expected in 2004. The park also has in place plans and protocols for handling structural fires and evacuating the park, if deemed necessary to ensure human safety.

The probability of destructive wildfire has likely increased slowly over the last 50-100 years as the effects of wildland fire suppression have accumulated. The negative consequences of disrupting the natural fire regime was not widely recognized in 1979 when the World Heritage Site nomination for Grand Canyon National Park was submitted; therefore, it was not mentioned.

Visitor and Tourism Pressures

5d) In completing this section what is required is an indication of whether the property can absorb the current or likely number of visitors without adverse effects (i.e., its carrying capacity). An indication should also be given of the steps taken to manage visitors and tourists. Possible impacts from visitation that could be considered include the following:

- i. damage by wear on stone, timber, grass or other ground surfaces ;*
- ii. damage by increases in heat or humidity levels;*
- iii. damage by disturbance to the habitat of living or growing things; and*
- iv. damage by the disruption of traditional cultures or ways of life.*

Factor: Visitation

Annual visitation at Grand Canyon National Park increased sharply through the 1980s and early 1990s to nearly 5 million people by 1993. Visitation leveled off in the 1990s, then dropped in recent years to about 4.3 million in 2002. Impact from the bulk of these visitors is concentrated in the developed portions of the park. While this impact is a serious concern, it should be remembered that the area of primary effect is less than 1% of the park's property. Most visitors never leave the rim, but even there visitation is highly circumscribed. Of the Grand Canyon's estimated 2,760 miles (4,600 km) of rim, less than 40 miles (67 km) is easily accessible or commonly visited. The majority of the park's geological and biological resources are protected from visitor impact by their remoteness, rugged topography, paucity of water, and hot temperatures in the summer when visitation is highest.

Within the heavily visited areas on the rims, visitor pressure is particularly intense in Grand Canyon Village and at overlooks along a 35-mile-long stretch of road on the South Rim. Natural resource impacts on the rims include social trailing; trampling of vegetation; soil compaction; graffiti (scratching) on rock; and harm to wildlife from habituation to humans, feeding by tourists, ingestion of trash, and traffic collisions. Damage caused by vehicles parked along roadsides is an ongoing problem in the summer. Air pollution from motor vehicles is a problem. Similar types of impacts (except those related to traffic) occur, although to a lesser degree, along the most heavily used inner canyon trails and at the most popular camps and attractions sites along the Colorado River. The most significant negative impacts of visitation are not to Grand Canyon's natural resources but to visitor experience. Traffic congestion and crowding at overlooks and visitor facilities detract from the visitor's ability to appreciate the values for which Grand Canyon National Park was designated. The most often heard complaints from visitors are about traffic congestion, vehicles parked along roadsides, and insufficient parking spaces.

Steps taken to manage visitors are described in sections 4n1 and 4t. The park's strategy for alleviating congestion, as framed in the General Management Plan (GMP), is to promote the use of public transit rather than personal vehicles. Long-term plans call for installing a light rail transit system and closing much of the developed portions of the park to personal vehicles. Other provisions of the GMP include construction of 73 miles (122 km) of new pedestrian and bicycle paths to encourage people to spread out from the overlooks and discover nonmotorized ways of experiencing park resources. Spacious, pedestrian-oriented visitor facilities like the new visitor orientation centers and the planned Heritage Education Campus are also designed to alleviate congestion and liberate visitors from their motor vehicles. Measures for reducing the effects of visitation on air quality are described in section 5b.

The GMP estimated that, if all elements of the plan were implemented, the daily maximum carrying capacity of the South Rim would be 22,500 visitors. It was predicted that this number would be reached by the year 2015. At that point, day use on the South Rim would have to be capped so that the carrying capacity would not be exceeded. Day use on the North Rim might have to be limited sometime between 2005 and 2010. These estimates were predicated on the effectiveness of the management actions and on a 50% growth in visitation by 2010. In fact, visitation has declined since the mid-1990s, and it is unlikely that the GMP projections will be met. On the other hand, plans for construction of the Tusayan gateway information center and a public transit system from that location into the park have fallen behind schedule. To keep the quality of visitor experience from deteriorating below current levels, it is possible that day-use limits will be considered in the future.

Education is the park's principal tool for minimizing visitor impact. Publications and signs inform visitors about the environmental harm of certain activities, such as straying off established paths and trails, littering, and feeding and approaching wild animals. Information about appropriate behavior to minimize harm to natural and cultural resources is provided to backcountry and river users along with their permits. Concession guides stress the importance of environmental stewardship to their clients. Concessioners understand that renewal of their contracts is contingent upon their being good stewards themselves. Ranger patrols on the rims, backcountry trails, and the river provide incentive for visitors to obey the rules about resource protection. Funding is limited, however, and distances are great. Ranger activity is often focused on visitor safety. Mechanical means of mitigating visitor impacts include trail construction and maintenance, revegetation of impacted areas, construction of barriers to guide foot traffic, trash collection, and eradication of graffiti. These efforts are continuous.

Number of Inhabitants Within Property and Buffer Zone

5e) Include the best available statistics or estimate of the number of inhabitants, if any, within the property and any buffer zone and describe any activities they undertake which affect the property.

Residents within the park include National Park Service staff, concession employees, and their families. Most of these people reside in Grand Canyon Village on the South Rim. According to the 2000 federal census, the village population totaled 1,460. Approximately, 350-400 people reside on the North Rim in May-October, with only caretaker staff living there the rest of the year. Park personnel also reside at three ranger stations within the canyon and one ranger station at Tuweep.

Park employees perform all resource management, visitor protection, interpretation, emergency services, general management, and maintenance functions in the park. Concession employees staff the visitor facilities described in section 4m. The park is too remote from urban centers to expect employees and their families to live off-site, although long-range plans call for transferring as many employees and commercial functions as possible to Flagstaff, about 80 miles south of the park. Negative effects of permanent and seasonal employees living within the park include the need to use park land for housing, a school, utilities, and other facilities required to support the population. The park must provide essential services for residents, requiring more employees and thus increasing traffic and vehicle emissions. The impacts, however, are minor compared to those of over 4 million visitors each year. Housing and related residential facilities are concentrated in a very small percentage of park lands and are virtually invisible to visitors.

The vast majority of land surrounding the park for 50 miles (83 km) is undeveloped federal, tribal, and Arizona State Trust land. Included in the approximately 12,000-square mile (31,000-sq km) area are nine federally designated wilderness areas, two national monuments, two national recreation areas, two districts of a national forest, two areas managed by the U.S. Bureau of Land Management, the Hualapai Indian Reservation, the Havasupai Indian Reservation, and a portion of the huge Navajo Indian Reservation. Small blocks of private land are scattered throughout the region, with a large block situated south of the Havasupai Indian Reservation. No private land abuts the park. This is a sparsely-settled, semi-arid region with little development. Only three paved roads and a few unpaved roads reach the rim of the Grand Canyon.

Population of this area (roughly the size of Belgium) totals no more than an estimated 30,000 individuals. Most people live in about two dozen scattered communities, all but four of which have populations under 1,000. The four largest towns (excluding Grand Canyon Village) have populations ranging from about 1,000 to about 8,200. One community of approximately 500, home to the Havasupai Indians, is located within the canyon but outside park boundaries. The only other community close to the park is Tusayan (see discussion of urban development under section 5a).

The primary land use throughout the region is livestock grazing. Cattle grazed on lands contiguous with the park occasionally wander onto park property. Other land uses in the region that affect or have potential to affect park resources are uranium mining, urban development in the gateway community of Tusayan, and the Navajo Generating Station near Page, Arizona. See sections 5a and 5b for discussions of these factors.

5f) List Other Factors

Factor: Aircraft Overflights

Tens of thousands of fixed-wing and helicopter tour flights pass over Grand Canyon each year. In western Grand Canyon, over 100 daily helicopter flights land on Hualapai tribal land in the canyon during the busiest tourist season. Commercial and private aircraft are not permitted below the rim within Grand Canyon National Park, but the National Park Service has no control over adjacent tribal property. The noise caused by sightseeing flights is impairing the natural quiet and soundscape of the park. It degrades visitor experience, particularly in backcountry areas and on the Colorado River. Aircraft noise may also disturb wildlife. Park biologists are particularly concerned about effects on desert bighorn sheep. Studies have shown that low-flying helicopters can initiate a flight response (i.e. fast escape) in wild sheep, which can result in injury. Repeated exposures can heighten vigilance, increase stress and energy expenditures, reduce foraging efficiency, and alter habitat use and may affect values under natural criterion (iv).

In response to growing complaints about noise, the U.S. Congress passed the National Parks Overflights Act in 1987, which required "substantial restoration of natural quiet" at Grand Canyon National Park. The National Parks Air Tour Management Act of 2000 affirmed that mandate and required that "quiet aircraft technology" be defined. To execute the intent of these and other statutes, the Federal Aviation Administration has established fixed routes and altitudes for air tours over Grand Canyon National Park, established flight-free zones, capped the number of aircraft authorized to conduct air tours, set curfews for certain parts of the canyon, set temporary limits on the number of tour flights allowed over the park annually (88,000), and proposed standards for quiet aircraft technology. A Final Rule governing implementation of quiet aircraft technology is pending. The Federal Aviation Administration and the National Park Service have been instructed to develop a comprehensive noise management plan for the substantial restoration of natural quiet in Grand Canyon. Preparation of this plan has been delayed; however, the ultimate objective has been defined. The National Park Service has determined that "substantial restoration of natural quiet" will be achieved when no aircraft noise is audible in 50% of the park for 75-100% of the day. Measuring progress toward that goal requires sophisticated modeling. An Aircraft Noise Model Validation Study has identified an effective and credible technique for doing this.

As a result of these efforts, some parts of the park (notably developed areas that receive the most visitation) are free of most aircraft noise. Other parts of the park, however, are heavily impacted, with touring planes and helicopters passing overhead several times each hour. Since 1987, the number of total sightseeing flights and resulting noise impacts have, in fact, greatly increased.

Factor: Nonnative Species

The number of known nonnative species in Grand Canyon National has increased since 1979. Over 150 exotic plant species have been documented in the park. Some of these plants are highly invasive and pose serious threats to native ecosystems. Tamarisk, for example, has replaced native plants as the dominant vegetative cover along the Colorado River and is spreading up tributaries. Nonnative plants are introduced into the park by natural agents (water, wind, birds and other wildlife, etc.) and by human ones (motor vehicles, shoes, clothing, equipment, etc.). It is impossible to prevent such introductions, and very difficult (if not impossible) to eradicate an invasive species once it has become established.

Nonnative animals have also been introduced into the park. Over a dozen nonnative fish species inhabit the Colorado River system in Grand Canyon. Nonnative trout were once intentionally stocked in the river, and some tributaries to create a sport fishery. While stocking has ceased, the cold, clear water of the post dam river has provided excellent conditions for the proliferation of these fish. Other species made their way into the park from reservoirs both upstream and downstream of park boundaries; still others may have been illegally introduced by anglers. Currently, the biomass of nonnative fish species in the Colorado River overwhelms the four remaining native species. The problem includes both predation and competition for finite resources.

The National Park Service and GCMRC have embarked on a multi-pronged program to reduce the population of nonnative fish species, particularly trout, in portions of the Colorado River system in Grand Canyon. Program elements include 1) physically removing nonnative fish from the Colorado River near the inflow of the Little Colorado River, 2) physically removing trout from tributaries where they spawn, and 3) releasing experimental high-fluctuating flows from the Glen Canyon Dam to disrupt trout spawning in the mainstem. The goal is not to eradicate nonnative fish from the park, but to suppress their numbers to give a competitive advantage to native fish species, particularly the endangered humpback chub.

Nonnative invertebrate species have also colonized the dam-altered river. The most recent invader is the highly invasive New Zealand mudsnail, which likely entered the system on the gear of anglers. This species has rapidly displaced native snails in other North American rivers. Nonnative aquatic species have affected the values under natural criterion (iv).

At the time of World Heritage Site designation (1979), feral burros were cited as a nonnative species of concern. In a highly successful campaign, most of the burros have been removed from park lands. A few occasionally wander onto park property from adjacent lands; however, they no longer present a significant ecological problem. Unfortunately, American bison do. In recent years, two herds maintained by a state agency for sport hunting have begun migrating onto park lands. Genetic tests have demonstrated that these bison contain cattle genes as a result of interbreeding when the herd was in private hands. Bison are large animals and cause major environmental impacts on soils, vegetation, ponds, and springs. Proposals to remove the bison and prevent further incursions have met resistance because advocates claim that this species was once native to the area. The issue is under investigation.

Efforts to control nonnative plants focus on over a dozen particularly troublesome species. The National Park Service conducts systematic inventories, monitors problem areas, and uses a combination of mechanical removal and chemical methods to control the target species. The use of herbicides depends on the plant in question and the sensitivity of the local environment. Several organizations in northern Arizona provide volunteers to help park employees with this labor-intensive effort. Park visitors are also given an opportunity to participate as part of an ongoing interpretive program. In the most logistically challenging effort, over 150 side canyons along the Colorado River have been surveyed for tamarisk, and an ambitious eradication effort is underway. A Vegetation Management Plan, which will include an exotic species management component, is scheduled for preparation in 2004.

II.6 Monitoring **(See Section 6 of the current Nomination Form)**

Administrative Arrangements for Monitoring Property

6a) Is there a formal monitoring program established for the site? In this case, "monitoring" means the repeated and systematic observation and collection of data on one or more defined factors or variables over a period of time.

YES

6a1) If YES, please describe the monitoring program, indicating what factors or variables are being monitored and which partners, if any, are or will be involved in the program.

Several monitoring programs have been implemented in Grand Canyon National Park. The Grand Canyon Monitoring and Research Center (GCMRC) monitors the following physical parameters in the Colorado River mainstem: water quality, streamflow, fine sediment transport and storage, and coarse-sediment inputs and storage. They also monitor streamflow and fine-sediment transport in two tributaries: the Paria River and the Little Colorado River. These tributaries are the primary contributors of sand and silt to the Colorado River in Grand Canyon. By closely observing their sediment input, special dam releases can be timed to enhance sediment storage in the mainstem. Subjects of ongoing biological monitoring in the river corridor include the phytobenthic community (aquatic food base), status and trends of the fish community in the mainstem and the Little Colorado River, the riparian ecosystem (including avifauna), and the endangered Kanab ambersnail. GCMRC, in collaboration with Grand Canyon River Guides (an association of professional guides), monitors the size and condition of camping beaches along the Colorado River. The purpose of GCMRC's monitoring program is to observe and measure the response of a long list of ecological variables to Glen Canyon Dam operations. Grand Canyon National Park has an oversight role in this monitoring, both as the permitting authority and as a member of the Glen Canyon Dam Adaptive Management Program, the parent body of GCMRC.

In the longest running monitoring program in the park, the National Park Service regularly measures air quality parameters at stations on the rim and within the canyon. At least one full-time position is dedicated to the program. Other monitoring subjects include water quality in selected inner canyon streams, discharge from South Rim springs, invasive nonnative plants, and a federally listed plant species. Backcountry trails and campsites are monitored for damage to ecological resources. The National Park Service also coordinates with GCMRC and several American Indian tribes on monitoring cultural resources, including archaeological sites, in the Colorado River corridor. Other organizations that assist the park with monitoring programs include the Grand Canyon National Park Foundation, Northern Arizona University, and nonprofit environmental groups.

At the national level, the National Park Service is laying the groundwork for a systematic approach to developing region-specific integrated natural resource monitoring programs. Regional networks within the park system are charged with defining the purpose and scope of the monitoring program; compiling and summarizing existing data and understanding of park ecosystems; developing conceptual models of relevant ecosystem components; selecting indicators and specific monitoring objectives for each; and determining the appropriate sampling design and sampling protocols. Existing monitoring efforts will be incorporated as appropriate. Once the design phases have been completed (December 2005), the program will be implemented in each park. Grand Canyon National Park is part of the Southern Colorado Plateau Inventory and Monitoring Network, which is administered under the Colorado Plateau Cooperative Ecosystems Studies Unit in partnership with Northern Arizona University.

Key Indicators for Measuring State of Conservation

6b) At the time of inscription of the property on the World Heritage list, or while in the process of reviewing the status of the property at subsequent meetings, have the World Heritage Committee and the State Party identified and agreed upon key indicators for monitoring the state of conservation of the property's World Heritage values?

NO

6b1) If YES, please list and describe these key indicators, provide up-to-date data with respect to each of them, and also indicate actions taken by the State Party in response to each indicator.

6b2) If NO key indicators were identified by the World Heritage Committee and used so far, please indicate whether the World Heritage Site management authority is developing or plans to develop key indicators for monitoring the state of conservation of the property's World Heritage Values.

As described in section 6a, identification of "ecological" indicators is part of the National Park Service's Inventory and Monitoring Program. Indicators (or "vital signs") are to be selected by October 1, 2004.

Results of Previous Reporting Exercises

6c) Please describe briefly the current status of actions the State Party has taken in response to recommendations from the World Heritage Committee at the time of inscription or afterwards, through the process known as "reactive reporting." (Note: The answer to this question will be "not applicable" for many sites.)

Not applicable

II.7 Conclusions

World Heritage Values

7a) Please summarize the main conclusions regarding the state of the World Heritage values of the property (see items II.2. and II.3. above).

Grand Canyon National Park still qualifies as a Natural World Heritage Site under criteria i, ii, iii, and iv. There have been no significant changes or degradation of the values articulated in those criteria. The State Party does not propose that the property be recognized for additional World Heritage values at this time. There have been no significant changes in the integrity of the property since inscription.

Management and Factors Affecting Site

7b) Please summarize the main conclusions regarding the management of and factors affecting the property (see items II.4. and II.5. above).

Grand Canyon National Park continues to be owned by the United States Government and managed by the National Park Service. As a national park, the property receives the highest level of conservation protection afforded by federal law in the United States. Since 1979, protection of land within the boundary has been expanded with the acquisition of state and private inholdings and the retirement of grazing leases, mineral leases, and rights-of-way. Management of the property is guided by a General Management Plan (1995) and several specific management plans. All plans are periodically updated.

Since 1979, visitation to the park has increased by 90%; however, most growth occurred in the 1980s and early 1990s. Visitation has dropped every year for the last three years. Visitor needs are accommodated by a wide range of facilities and services, but demand substantially exceeds availability during the high-use season (summer). Crowding and lines are typical at museums, most visitor centers, restaurants, and other facilities. Traffic remains congested and parking is inadequate. A new, spacious orientation facility, many miles of new pedestrian/bicycle path, and expanded shuttle bus service have relieved crowding in some areas.

Despite some improvements, crowding in the park's relatively small developed areas (particularly the South Rim) is the National Park Service's most pressing management issue. Additional pressures include tour overflights and helicopter traffic within the canyon, both of which have increased markedly since 1979. Air quality, although generally good, has deteriorated since 1979. Levels of some pollutants have improved (decreased) since 1990, but ozone worsens. Progress has been made locally in decreasing emission sources, but regional haze is a greater problem and more difficult to solve. These three pressures—visitation, aircraft, and air quality—all affect or potentially affect World Heritage values to some degree. For example, visitation impacts include vegetation trampling, soil compaction, and harm to wildlife. Aircraft noise can negatively affect wildlife, particularly sensitive species like desert bighorn sheep. Elevated ozone levels have the potential to harm sensitive plants. In all three cases, however, the impacts on visitor perception and experience are more severe than impacts to natural resources.

Crowding, noise, and haziness all detract from the visitor's ability to recognize and appreciate Grand Canyon's values—especially its superlative aesthetic qualities.

Other pressures directly affect, or have the potential to affect, ecological processes. Groundwater pumping for urban development has the potential to deplete Grand Canyon seeps and springs that draw water from the same aquifer. The existence of Glen Canyon Dam upstream of the park boundary has irreparably changed the Colorado River ecosystem in Grand Canyon, and such effects as the loss of fine sediment from the system are inevitable without intrusive human intervention (artificial sediment augmentation). Effects of the dam and its operations on a multitude of interrelated aquatic and riparian resources are particularly detrimental. Releases typical of the dam's first 30 years of operation were thought to be harmful, but a new flow regime initiated in 1992 has not resulted in significant improvements. Uranium mining within park boundaries has ceased to be a concern, but mining outside the park, if resumed, has the potential to harm water quality, aquatic life, and riparian habitats within the park. The residue of past mining operations still contaminates some areas. Livestock grazing is less of a problem than it was when grazing leases were valid on some park lands. Occasional trespass by livestock, and the recent appearance of bison on the North Rim, exert pressure on park resources.

The potential for destructive wildfire increased over time with the accumulated effects of systematic fire suppression. The problem posed by invasive nonnative species, particularly plants, has also grown worse with time, in large part because human technology has facilitated the movement of species planet-wide. Invasive nonnative species, like tamarisk and the New Zealand mudsnail in Grand Canyon, have the ability to displace native species and disrupt entire ecosystems.

Proposed Future Action(s)

7c) Please describe briefly future actions that the State Party has approved to ensure the conservation of the World Heritage values of the property.

These sample headings can be used as a checklist.

- Modification of legal or administrative structure*
- Changes to financial arrangements*
- Increases to staffing level*
- Provision of training*
- Modification of visitor facilities*
- Preparation of a visitor management plan*
- Studies of public knowledge of the World Heritage Site*
- Emergency preparedness*
- Establishment or improvement of a monitoring program.*

Conservation of the World Heritage values at Grand Canyon National Park is furthered by a phalanx of federal laws and regulations, National Park Service policies, park-specific management plans, and other actions. The various processes underway to address pressures on the park's World Heritage values are described in section 5. They include implementation of Grand Canyon National Park's General Management Plan (1995), Resource Management Plan (1997), Fire Management Plan (1995 as amended in 1998), Colorado River Management Plan (1989), and Backcountry Management Plan (1988).

Revisions of the latter three plans are in progress. The National Park Service and the Federal Aviation Administration are required to develop a noise management plan for addressing aircraft over Grand Canyon, but the timeline for that plan has yet to be decided. Western states are in the process of developing plans to reduce visibility-impairing regional haze. Scheduled completion dates for those plans range from 2003 to 2008.

The focus of the General Management Plan is improvement of visitor facilities to relieve crowding (see section 4n1 for a description). Implementation of plan elements depends on appropriations from the U.S. Congress and support from other federal programs and private donations. Several plan elements have been completed and others, such as construction of a second orientation center on the South Rim and planning for the Heritage Education Campus, are underway. Construction of a transit center in the gateway community of Tusayan and an associated light rail system have been delayed. It is unclear if those elements of the General Management Plan will be completed in the plan's original timeframe (by 2010).

Monitoring the condition of resources is a critical component of conservation efforts. Current monitoring efforts, including the multifaceted Grand Canyon Monitoring and Research Center program, will continue into the future as long as the need and funding permit. The National Park Service's Inventory and Monitoring Program will proceed as described in section 4 and 6a1.

The park's present legal and administrative structure, financial arrangements, and provision of training will remain in place. No increases to the staffing level have been approved at this time.

Responsible Implementing Agency(ies)

7d) Please identify the agency(ies) responsible for implementation of these actions described in 7c, if different from those listed in Section II.4.

Responsible Implementing Agency #1

Entity National Park Service, Grand Canyon National Park
First Name: Joseph
Last Name: Alston
Address: P.O. Box 129
City: Grand Canyon
State/Prov: Arizona
Postal Code: 86023-0129
Telephone: 928-638-7945
Fax: 928-638-7815
Email: joe_alston@nps.gov

Timeframe for Implementation

7e) If known, or predictable, please provide a timeline for the implementation of the actions described in 7c.

The timeframe of implementing the 1995 General Management plan is 10-15 years. A revised general management plan should be in place at the end of that period. The Grand Canyon Monitoring and Research Center monitoring program is ongoing. Designing the National Park Service's integrated monitoring program is scheduled in three phases:

Phase 1 - October 1, 2003

Phase 2 - October 1, 2004

Phase 3 - December 2005

Phase 1 has been completed. Implementation of the integrated monitoring program at Grand Canyon National Park is anticipated for 2006.

Needs for International Assistance

7f) Is it anticipated that International Assistance, through the World Heritage Fund, will be requested for any of the planned actions described above?

No

Potential Decisions for the World Heritage Committee

7g) Please indicate if the World Heritage Site management authority has preliminarily identified, as a result of this reporting exercise, an apparent need to seek a World Heritage Committee decision to change any of the following:

(Note: Following completion of the Periodic Report exercise, the State Party, in consultation with appropriate authorities, will determine whether to proceed with seeking a Committee decision on these changes. To request such changes, the State Party will need to follow a separate, formal process, subsequent to submitting the report.)

- change to criteria for inscription
- change to Statement of Significance
- proposed new Statement of Significance, where previously missing
- change boundaries or buffer zone

II.8 Documentation

(See Section 7 of the current Nomination Form and Section 3 of the original Nomination Form)

8a) Please review the original nomination for the property to determine whether it is necessary or advisable to supply, update or amend any of the following documentation for the World Heritage Site. Indicate what documentation will be supplied to supplement the information found in this report. (This documentation should be supplied at the time the Periodic Report is submitted to the World Heritage Centre, in December 2004.)

- a) Photographs, slides and, where available, film. This material should be accompanied by a duly signed authorization granting, free of charge to UNESCO, the non-exclusive right for the legal term of copyright to reproduce and use it in accordance with the terms of the authorization attached.
- b) Topographic or other map or site plan which locates the WHS and its boundaries, showing scale, orientation, projection, datum, site name, date and graticule.
- c) A copy of the property management plan.
- d) A Bibliography consisting of references to all the main published sources on the World Heritage Site, compiled to international standards.

URL: <http://www.grandcanyonbiblio.org/search/>

Description: An up-to-date Grand Canyon bibliography with approximately 25,000 entries is available online at the above URL. The citation for a hardcopy of that bibliography is:

Spamer, E.E. 2003. Bibliography of the Grand Canyon and Lower Colorado River. Grand Canyon Association, Grand Canyon, Arizona.

8b) Do you have a digital map of the WHS, showing its location and boundaries?

YES

8bi) If yes, in what format(s) is the map?

PDF

8bii) *Is it published on a publicly-accessible website?*

NO

8biii) *If yes, please provide the URL of the site where the map can be found. Must be a valid URL.*

SELECTED BIBLIOGRAPHY:

Aitchison, Stewart W. 1997. Grand Canyon National Park. Mariposa, California: Sierra Press.

Anderson, Michael F. 2001. Polishing the Jewel: An Administrative History of Grand Canyon National Park. Grand Canyon Association, Monograph 11.

Brown, Bryan T., Steven W. Carothers, and R. Roy Johnson. 1987. Grand Canyon Birds. Tucson, University of Arizona Press.

Carothers, Steven W., and Brown, Bryan T. 1991. The Colorado River through Grand Canyon; Natural History and Human Change. Tucson: University of Arizona Press.

Euler, Robert C. (Editor). 1984. Archaeology, Geology, and Paleobiology of Stanton's Cave, Grand Canyon National Park, Arizona. Grand Canyon Natural History Association, Monograph 6.

Fishbein, Seymour L. 1997. Grand Canyon Country: Its Majesty and Its Lore. Washington, D.C.: Book Division, National Geographic Society.

Hoffmeister, Donald Frederick. 1971. Mammals of Grand Canyon. Urbana, Illinois: University of Illinois Press.

Hughes, J. Donald. 1978. In the House of Stone and Light - A Human History of the Grand Canyon. Grand Canyon Natural History Association.

Lamb, Susan (Editor). 1994. Best of Grand Canyon Nature Notes 1926–1935. Grand Canyon, Arizona: Grand Canyon Natural History Association.

Miller, Donald, Robert A. Young, Thomas W. Gatlin, and John A. Richardson. 1982. Amphibians and Reptiles of the Grand Canyon National Park. Grand Canyon Natural History Association, Monograph 4.

Phillips, Arthur M., III, and John Richardson. 1990. Grand Canyon Wildflowers. Grand Canyon Natural History Association.

Phillips, Barbara G., Arthur M. Phillips, III, and Marilyn Ann Schmidt Bernzott. 1987. Vascular Plants of Grand Canyon National Park. Annotated checklist of vascular plants of Grand Canyon National Park, 1987. Grand Canyon Natural History Association, Monograph 7.

Price, L. Greer. 2003. Grand Canyon: The Story Behind the Scenery. Las Vegas: KC Publications.

Pyne, Stephen J. 1995. Fire on the Rim: A Firefighter's Season at the Grand Canyon. Seattle, Washington: University of Washington Press.

Redfern, Ron. 1983. Corridors of time : 1,700,000,000 Years of Earth at Grand Canyon. New York: Times Books.

Schmidt, Jeremy. 1993. Grand Canyon : A Natural History Guide. Boston and New York: Houghton Mifflin Co.

Webb, Robert H., John C. Schmidt, G. Richard Marzolf, and Richard A. Valdez (eds). 1999. The Controlled Flood in Grand Canyon. Washington, D.C.: American Geophysical Union. Geophysical Monograph, 110.

Zwinger, Ann Haymond. 1995. Downcanyon. Tucson: University of Arizona Press.